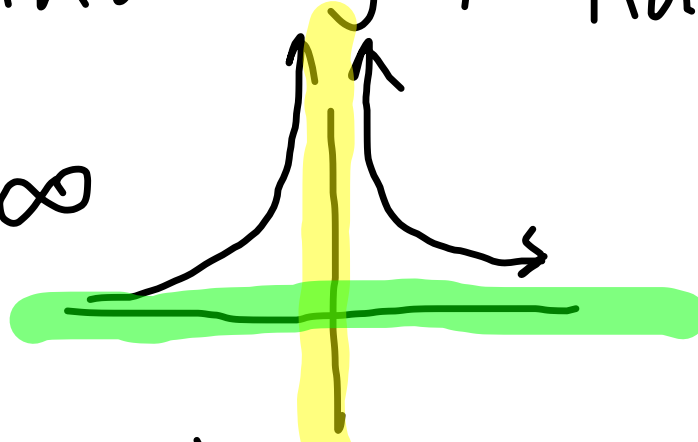


2.2 limits involving infinity

$$\lim_{x \rightarrow 0^{\pm}} \frac{1}{x^2} = \infty$$



vertical Asymptote : $x=0$

horizontal Asymptote : $y=0$

$$\lim_{x \rightarrow \infty} \frac{1}{x^2} = 0$$

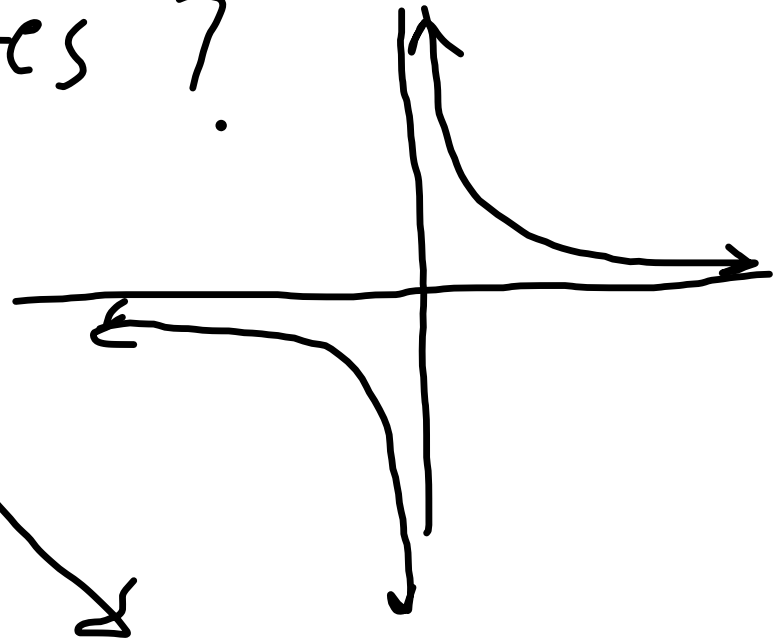
$$y = \frac{1}{x}$$

asymptotes ?

VA: $x=0$ HA: $y=0$

$$\lim_{x \rightarrow 0^+} \frac{1}{x} = \infty$$

$$\lim_{x \rightarrow 0^-} \frac{1}{x} = -\infty$$



$$\lim_{x \rightarrow \infty} \frac{1}{x} = 0$$

$$\lim_{x \rightarrow -\infty} \frac{1}{x} = 0$$

find asymptotes

$$y = \frac{2x+1}{x} = 2 + \frac{1}{x}$$

H.A. $\lim_{x \rightarrow \infty} \frac{2x+1}{x} = 2$

H.A: $y = 2$

or $\lim_{x \rightarrow -\infty} \frac{2x+1}{x} = 2$

V.A. $\lim_{x \rightarrow 0^+} \frac{2x+1}{x} = \infty$ vA

$\lim_{x \rightarrow 0^-} \frac{2x+1}{x} = -\infty$ $x=0$

$$y = \frac{\sin x}{x}$$

asymptotes?
do graphically

Horiz Asymptote:
vert "

p 70

$$\lim_{x \rightarrow \infty} f(x) = b$$

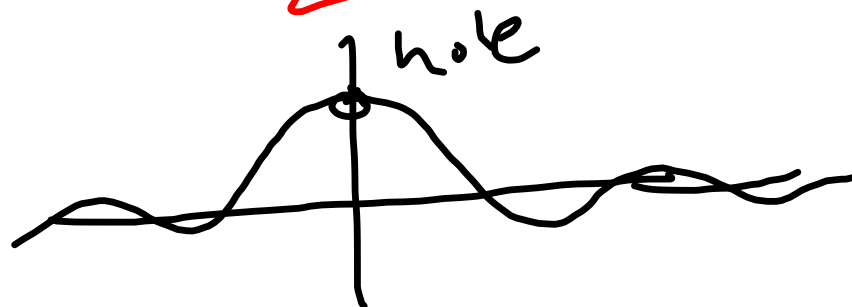
$$\text{HA } y = b$$

p 72

$$\lim_{x \rightarrow a} f(x) = \infty$$

$$\text{A } \lim_{x \rightarrow \infty} \frac{\sin x}{x} = 0$$

$$\checkmark \lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$



$$-\frac{1}{x} \leq \frac{\sin x}{x} \leq \frac{1}{x}$$

\downarrow
 \downarrow

0
 0

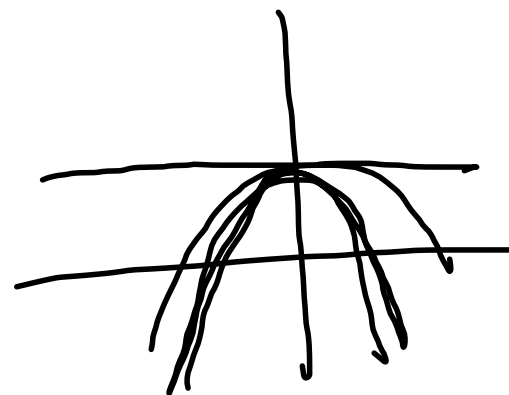
$x \rightarrow \infty$

$$\cos x \leq \frac{\sin x}{x} \leq 1$$

\downarrow
 \downarrow

1
 1

$x \rightarrow 0$



end behavior models

Ex 6

$$y = \frac{3x^4 - 2x^3 + 3x^2 - 5x + 6}{3x^4}$$

ebm

$$y = \frac{3x^4}{3x^4} = 1$$

the function looks like
It's ebm when x is
big

7a

$$y = \frac{2x^5 + x^4 - x^2 + 1}{3x^2 - 5x + 7}$$

ebm

$$y = \frac{2x^5}{3x^2} = \left(\frac{2}{3} x^3 \right)$$